Cabinet Cleaning

Tools/Equipment

Soft cloth, *lightly* dampened with water and mild detergent

Method

1. Disconnect the Warming Unit from the power source.
2. Wipe the exterior of the Warming Unit clean.

CAUTION: *Do not use a dripping wet cloth when cleaning the Warming Unit. Moisture may seep into the electrical contacts and damage the components. Do not use alcohol or other solvents to clean the cabinet. Solvents may damage the labels and other plastic parts.*

Hose Replacement

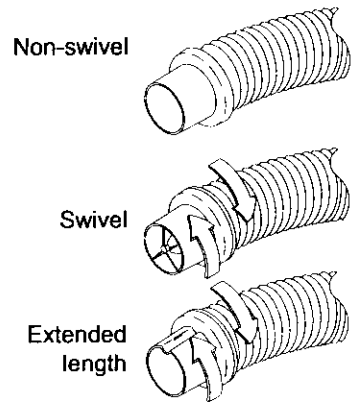
Method

1. Grasp the hose at the base and pull it free from the hose coupling flange.
2. Insert the new hose in the blower outlet flange.

   NOTE: *There are a number of variations of hoses (Figure 1) to provide for specific therapeutic needs. These various hose options are not interchangeable. If the hose were to be mated improperly, there would be an obvious fit problem. Do not force a hose into a fitting, use adapters, or modify the hose ends. Use of a wrong hose could result in temperatures outside of the indicated range.*

3. Record the maintenance action taken and hours of operation (read from the hour meter) in the Maintenance Log (Appendix).

Figure 1. Hose Options



Power Fuse Replacement

The power fuses are located in the power entry module. ***NOTE:*** *A spare fuse is located in the fuse carrier* (see Figure 2).

Tools/Equipment

- Phillips-head screwdriver
- Small slotted screwdriver

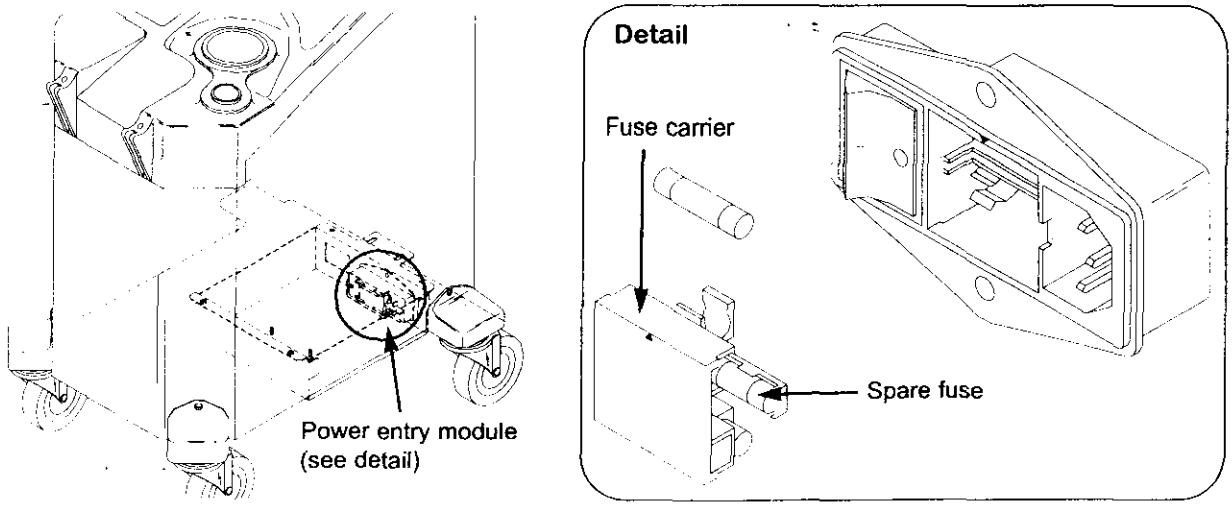
Method

1. Disconnect the Warming Unit from the power source.
2. Remove the two (2) Phillips-head screws that secure the cord retainer. Remove the power cord.
3. Locate the fuse carrier in the center of the power entry module (see Figure 2).
4. Use the small screwdriver to remove the fuse carrier from the power entry module.
5. Remove the blown fuse(s) from the fuse carrier.
6. Place the new fuse(s) (as marked) into the fuse carrier.

CAUTION: *Replace only with the fuse capacity and type that is indicated on the adjacent label.*

7. Replace the fuse carrier into the power entry module.
8. Reattach the power cord.
9. Replace the two (2) Phillips-head screws to reattach the cord retainer.
10. Reconnect the Warming Unit to the power source.
11. Record the maintenance action taken and the hours of operation (read from the hour meter) in the *Maintenance Log* (Appendix).

Figure 2. Location of Power Fuse



Control Board Fuse Replacement

The 200mA (100mA for 220-240V units) control board fuse is located on the control board. (See Figure 3.) If the 500mA fuse requires replacement, please call Technical Service.

The internal fuse on the model 500/OR is for control board functions only. The power fuses are located in the power entry module. Instructions for power fuse replacement can be found in the *Power Fuse Replacement* section.

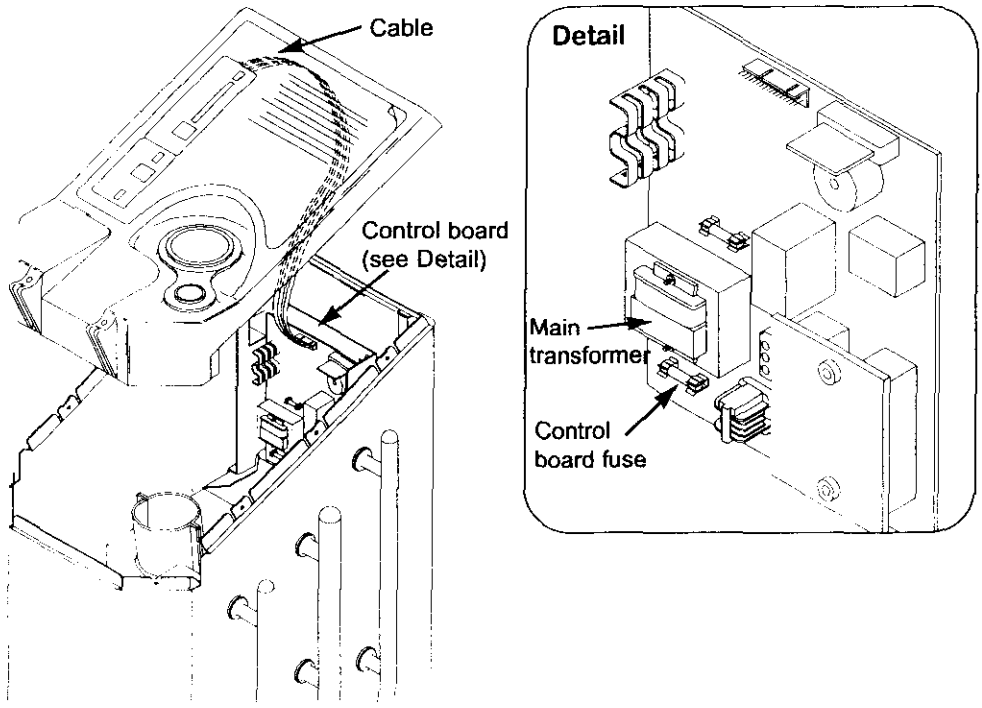
Tools/Equipment

Phillips-head screwdriver

Method

1. Disconnect the Warming Unit from the power source.
2. Remove the eight (8) Phillips-head screws around the top cover.
3. A cable is attached to the underside of the cover (see Figure 3). Carefully lift the cover straight up about three (3) inches (7.6 cm).
4. Tilt the cover to access the mounted cable which attaches to the cover's display board. Note the direction in which the cable connector is mounted and detach it from the display board.
5. The control board fuse is near the main transformer (see Figure 3).

Figure 3. Location of Control Board Fuse



6. Remove the fuse and replace with a new one.

CAUTION: *Replace only with the fuse capacity and type that is indicated on the adjacent label.*

7. Reconnect the cable to the display board (ensure that the mounting direction is correct).
8. Place the top cover back into position.
9. Replace the eight (8) Phillips-head screws around the cover.
10. Reconnect the Warming Unit to the power source.
11. Record the maintenance action taken and the hours of operation (read from the hour meter) in the *Maintenance Log* (Appendix).

Air Filter Replacement

The air filter is mounted inside the rear access panel.

Tools/Equipment

Phillips-head screwdriver

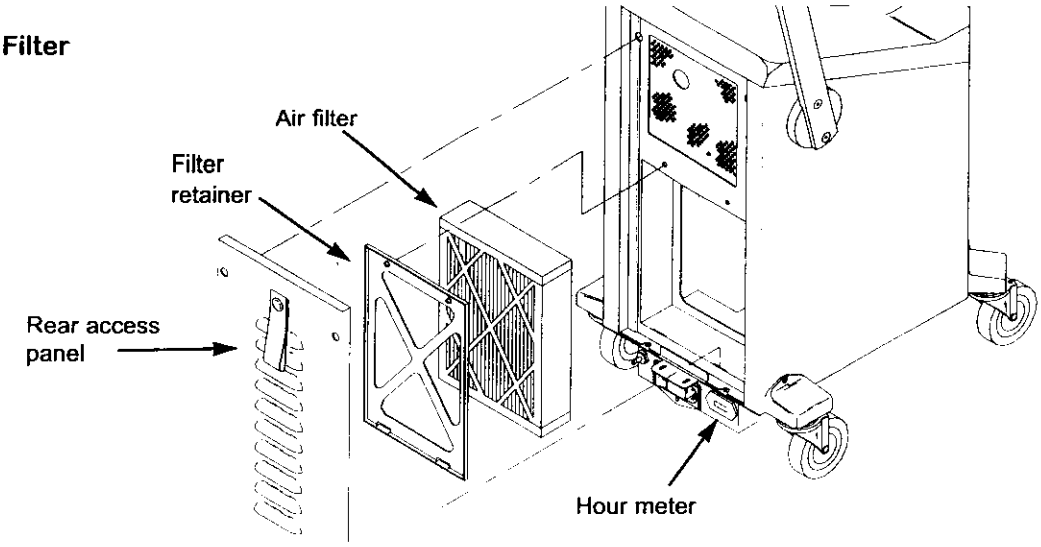
Service Frequency

Six-month intervals, or 500 hours of use

Method

1. Disconnect the Warming Unit from the power source.
2. Loosen the two (2) Phillips-head 1/4-turn screws on the rear access panel. Tilt the panel out and remove it.
3. Loosen the two (2) Phillips-head 1/4-turn screws on the filter retainer, remove the retainer, and pull out the filter.
4. Record the hour meter reading and date on the new air filter label.
5. Place the new filter into the filter box, as shown below ("cross-bars" on the filter face OUT).
6. Replace the filter retainer.
7. Tighten the two (2) Phillips-head 1/4-turn screws on the filter retainer.
8. Replace the rear access panel.
9. Tighten the two (2) Phillips-head 1/4-turn screws on the rear access panel.
10. Reconnect the Warming Unit to the power source.
11. Read the hour meter, located on the lower right-hand corner in the back of the Warming Unit (see Figure 4). Record the hours and maintenance action taken in the *Maintenance Log* (Appendix).

Figure 4.
Location of Air Filter



Over Heat Alarm Testing

WARNING: *Perform all testing and adjustments of Warming Unit temperature with a calibrated Model 221 Temperature Test Kit or a Model 22110 Temperature Test Unit. Augustine Medical, Inc. assumes no responsibility for the reliability, safety, or performance of the Bair Hugger® System if Warming Unit temperature testing or adjustments are made in any other manner than that described here. Improper measurement or adjustment of the Warming Unit's over heat alarm setting could result in patient exposure to temperatures outside of the indicated range, and may lead to patient injury.*

NOTE: *The Model 221 Temperature Test Kit and the Model 22110 Temperature Test Unit are designed to simulate the operating characteristics of Bair Hugger Blankets when used with Bair Hugger Warming Units; use of the temperature test device with any other warming system may result in imprecise readings.*

If using the Model 221 Test Kit, temperature readings are taken from the test kit itself. If using the Model 22110 Test Unit, temperature readings are taken from a calibrated temperature meter.

Service Frequency

Six-month intervals, or 500 hours of use

Tools/Equipment

- Model 221 Temperature Test Kit or Model 22110 Temperature Test Unit
- Phillips-head screwdriver
- Short jumper wire with alligator clips

If using the Model 22110 Temperature Test Unit:

- Use a calibrated temperature meter that can accept a male subminiature connector and that can read a K style thermocouple (e.g., a Fluke Model 52 K/J Thermometer).
- If the connector does not fit your meter, you can remove the provided connector and attach a connector that fits your meter.

Method

1. Disconnect the Warming Unit from the power supply.
2. Loosen the two (2) Phillips-head screws on the rear access panel. Lift the access panel to remove it.

3. Two (2) test point leads (TP3 & TP4) protrude in the exposed area of the board (see Figure 5). Place a jumper wire between the test points.

4. Insert the open hose end from the Warming Unit in the port on the temperature test device (see Figure 6).

   NOTE: *Do not block the rear air vents on the test device.*

Figure 5. Location of TP3 and TP4

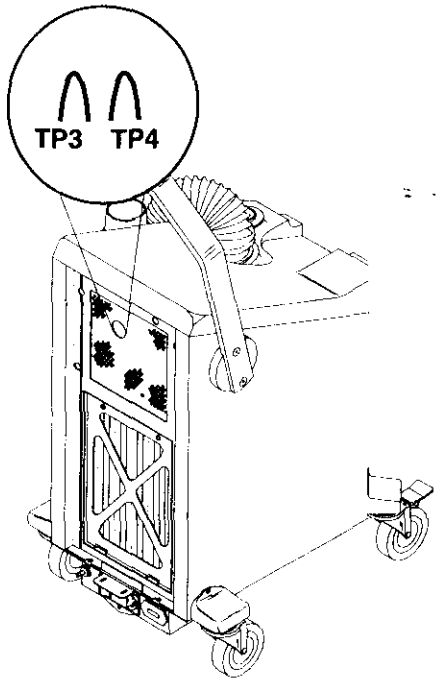
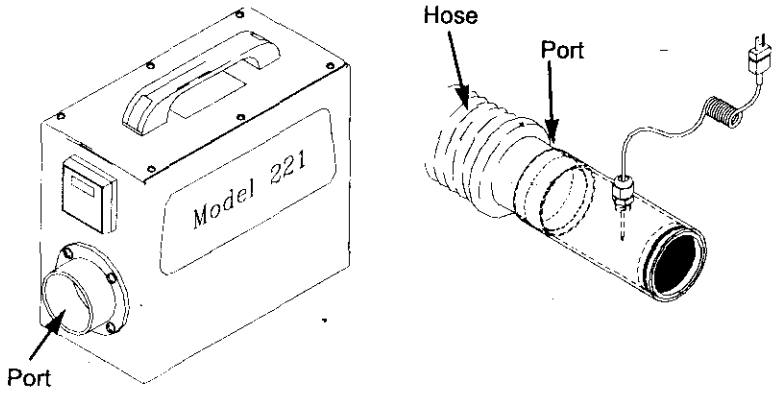


Figure 6. Model 221 Temperature Test Kit and Model 22110 Temperature Test Unit



5. Connect the Warming Unit to the power source and turn the Warming Unit power ON.

   NOTE: *The temperature setting will not affect the over heat test because the control circuit has been bypassed by the jumper wire.*

6. When the over heat alarm activates both visually and audibly, note the maximum temperature achieved. Let the alarm operate for at least one (1) minute, or until the temperature read-out is approximately 38°C (100°F), then, turn the Warming Unit OFF and then ON; the alarm should also turn off. The alarm and manual reset constitutes one cycle.

   NOTE: *If the alarm does not reset, allow the Unit to alarm for one (1) minute before turning the Warming Unit OFF, then ON again.*

7. Allow the Warming Unit to cycle two (2) times more, after the first satisfactory reading. When the alarm activates, note the alarm temperature read-out. See Table 1 for specified limits.

   NOTE: *The first over heat cycle temperature may be slightly higher when started from a cold start.*

8. If the results of the test **did not** meet specified limits, adjust the over heat thermostat. See the *Over Heat Alarm Thermostat Adjustment* section.
9. If the results of the test **did** meet specified limits, turn the Warming Unit power OFF, and disconnect the Warming Unit from the power source.
10. Remove the hose end from the port on the temperature test device.
11. Remove the jumper wire and reinstall the rear access panel.
12. Record the maintenance action taken and hours of operation (read from the hour meter) in the *Maintenance Log* (Appendix).

Table 1. Over Heat Specification

Model 500 Series High Temperature Thermostat
The thermostat interrupts power to the heater and activates the alarm at a preset high temperature of 53° ± 3°C, 127.4° ± 5.4°F, or less, at the end of the hose, as determined by the Model 221 Temperature Test Kit and the Model 22110 Temperature Test Unit.

Over Heat Alarm Thermostat Adjustment

WARNING: *Improper adjustment of the Warming Unit's over heat alarm setpoint could result in patient exposure to temperatures outside of the indicated range, and may lead to patient injury.*

- *Closely follow instructions for thermostat adjustment.*
- *Dangerous voltages are present at the terminals of the thermostat.*
- *Always use a Model 221 Temperature Test Kit or a Model 22110 Temperature Test Unit to verify output temperatures.*
- *Recalibrate the Temperature Test Kit at least once a year. The Model 22110 Temperature Test Unit does not need to be calibrated. The meter it is connected to must be calibrated. Follow the calibration instructions in the meter service manual or follow standard facility calibration schedules.*
- *When in doubt, contact Technical Service for assistance in temperature adjustment.*

Tools/Equipment

- Model 221 Temperature Test Kit or Model 22110 Temperature Test Unit
- Small slotted screwdriver
- Phillips-head screwdriver
- Short jumper wire with alligator clips

If using a Model 22110 Temperature Test Unit:

- Use a calibrated temperature meter that can accept a male subminiature connector and that can read a K style thermocouple (e.g., a Fluke Model 52 K/J Thermometer).
- If the connector does not fit your meter, you can remove the provided connector and attach a connector that fits your meter.

Method

1. Disconnect the Warming Unit from the power source.
2. Loosen the two (2) Phillips-head 1/4-turn screws on the rear access panel. Lift the access panel to remove it.
3. Two (2) test point leads (TP3 & TP4) protrude in the exposed area of the board (see Figure 5); place a jumper wire between the test points.
4. Insert the open hose end from the Warming Unit in the port on the temperature test device.

   NOTE: *Do not block the rear air vents on the test device.*

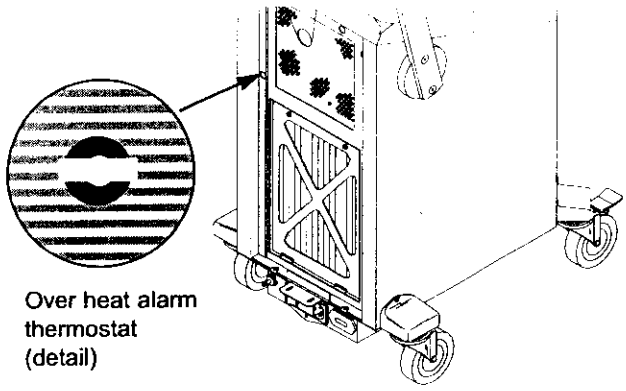
5. Reconnect the Warming Unit to the power source. Turn the power ON.

   NOTE: *The temperature setting will not affect the over heat test because the control circuit has been bypassed by the jumper wire.*

6. Locate the over heat adjustment thermostat (see Figure 7).

NOTE: *Adjustment of the over heat alarm thermostat is most easily done while the temperature read-out is climbing.*

Figure 7. Location of Over Heat Alarm Thermostat



7. Use a small slotted screwdriver to adjust the thermostat.
   - If the tested alarm temperature was **below** the specified limits, turn the screwdriver CLOCKWISE to increase the alarm temperature.
   - If the tested alarm temperature was **above** specified limits, turn the screwdriver COUNTERCLOCKWISE to lower the alarm temperature.
8. Fine-tune the adjustment until the Warming Unit alarms at the specified temperature.
9. When the over heat alarm activates both visually and audibly, note the maximum temperature achieved. Let the alarm operate for at least one (1) minute, or until the temperature read-out is approximately 38°C (100°F), then, turn the Warming Unit OFF and then ON; the alarm should also turn off. The alarm and manual reset constitutes one cycle.
10. Retest the alarm temperature to verify correct adjustment at least two (2) times. Allow the Warming Unit to cycle before each test.
11. When the Warming Unit alarm setting is within the specified limit, turn the Warming Unit OFF, and disconnect it from the power source.
12. Remove the hose end from the port on the temperature test device.
13. Remove the jumper from between the test points, and close the rear access panel. Resecure the screws.
14. Record the maintenance action taken and the hours of operation (read from the hour meter) in the *Maintenance Log* (Appendix).

Normal Operating Temperature Testing

WARNING: *Perform all testing and adjustments of Warming Unit temperature with a calibrated Model 221 Temperature Test Kit or a Model 22110 Temperature Test Unit. Augustine Medical, Inc. assumes no responsibility for the reliability, safety, or performance of the Bair Hugger® System if Warming Unit temperature testing or adjustments are made in any other manner than that described here. Improper measurement or adjustment of the Warming Unit's normal operating temperature could result in patient exposure to temperatures outside of the indicated range, and may lead to patient injury.*

NOTE: *The Model 221 Temperature Test Kit and the Model 22110 Temperature Test Unit are designed to simulate the operating characteristics of Bair Hugger Blankets when used with Bair Hugger Warming Units; use of the temperature test device with any other warming system may result in imprecise readings.*

Service Frequency

Six-month intervals, or 500 hours of use

Tools/Equipment

Model 221 Temperature Test Kit or the Model 22110 Temperature Test Unit

Method

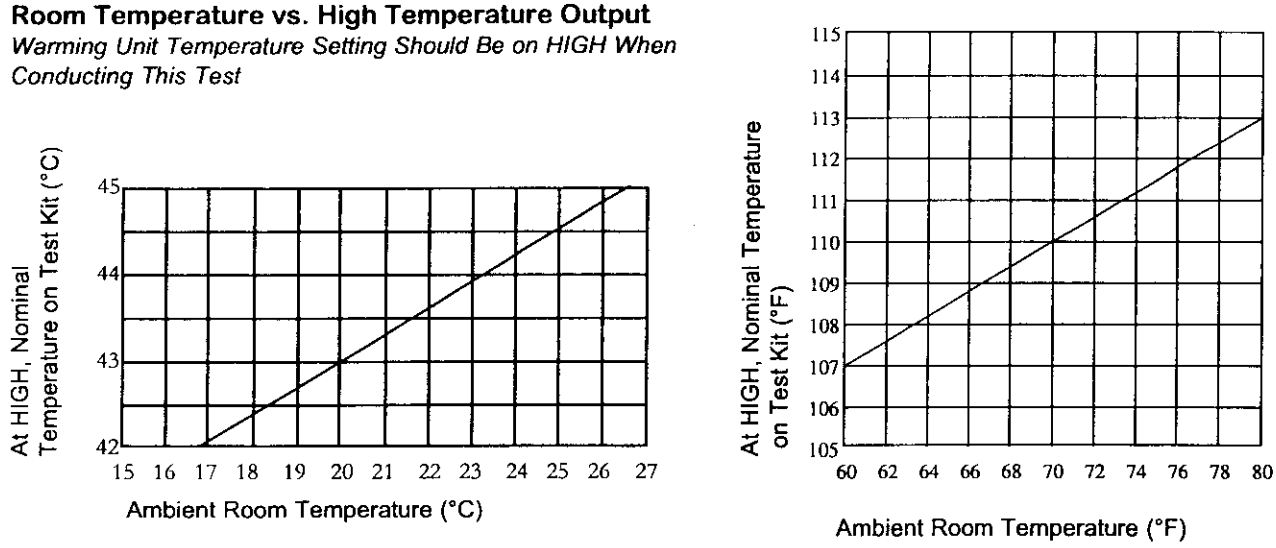
1. Insert the open hose end from the Warming Unit in the port on the temperature test device (see Figure 6).

   NOTE: *Do not block the rear air vents on the test device.*

2. Turn the Warming Unit power ON and select the HIGH temperature setting. Always begin testing at the HIGH setting.
3. Note the ambient room temperature.

4. After approximately five (5) minutes of operation, note the temperature read-out. Use Figure 8 to correlate ambient temperature to the Warming Unit's operating temperature.

Figure 8.
Room Temperature vs. High Temperature Output
Warming Unit Temperature Setting Should Be on HIGH When Conducting This Test



5. After correcting for ambient temperature, the tested normal operating temperature should meet the limits specified in Table 2.
6. If the HIGH temperature setting **is not** within specified limits, adjust the normal operating temperature. See the Normal Operating Temperature Adjustment section.
7. If the HIGH temperature setting **is** within specified limits, verify the MED, and then LOW settings against specified limits (allow the Warming Unit to operate at each temperature setting for about three (3) to five (5) minutes before the test).
8. Turn the Warming Unit OFF. Remove the hose end from the port on the temperature test device.
9. Record the maintenance action taken and the hours of operation (read from the hour meter) in the *Maintenance Log* (Appendix).

Table 2. Model 500 Series Operating Temperatures
(Operating temperature = Average temperature at the end of the hose.)

HIGH:	43° ± 3°C (109.4° ± 5.4°F)
MED:	38° ± 3°C (100.4° ± 5.4°F)
LOW:	32° ± 3°C (89.6° ± 5.4°F)

Note: Air temperature reaching the patient is approximately 2°C lower than the listed temperatures.

Normal Operating Temperature Adjustment

WARNING: *Improper adjustment of the Warming Unit's normal operating temperature could result in patient exposure to temperatures outside of the indicated range, and may lead to patient injury.*

- *Closely follow instructions for temperature adjustment.*
- *Always use a Model 221 Temperature Test Kit or a Model 22110 Temperature Test Unit to verify output temperatures.*
- *Always make adjustments relative to the HIGH temperature setting on the Warming Unit. When the HIGH setting is accurately adjusted, the MED and LOW settings should also be within specified limits. If the HIGH range is properly set, and MED and/or LOW do not meet specs, call AMI Technical Service.*
- *Recalibrate the Temperature Test Kit at least once a year. The Model 22110 Temperature Test Unit does not need to be calibrated. The meter it is connected to must be calibrated. Follow the calibration instructions in the meter service manual or follow standard facility calibration schedules.*
- *When in doubt, contact AMI Technical Service for assistance in temperature adjustment.*

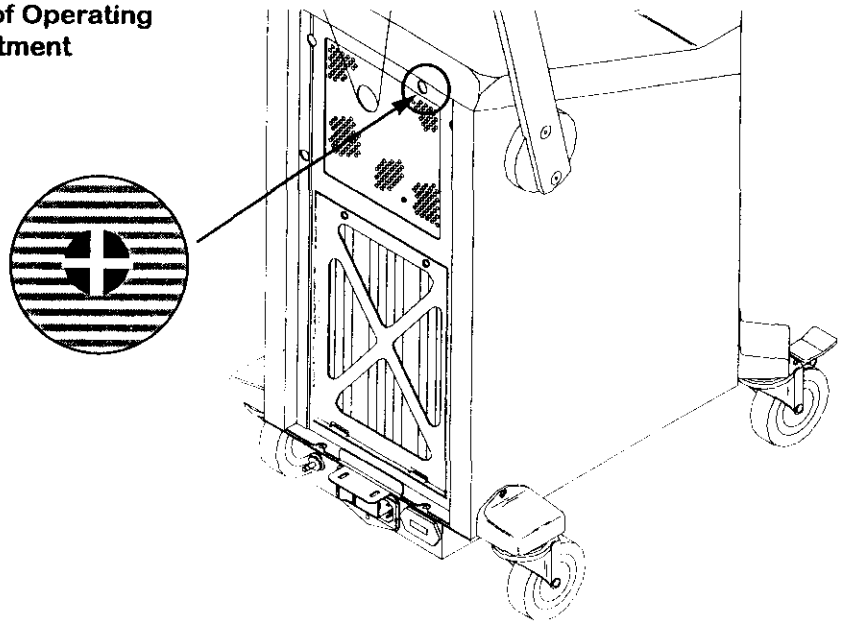
Tools/Equipment

- Model 221 Temperature Test Kit or Model 22110 Temperature Test Unit
- Small slotted screwdriver
- Phillips-head screwdriver

Method

The operating temperature adjustment potentiometer may be accessed through an opening in the upper right corner of the rear access panel (see Figure 9).

Figure 9. Location of Operating Temperature Adjustment Potentiometer



1. Insert the open hose end from the Warming Unit in the port on the temperature test device.

   NOTE: *Do not block the rear air vents on the test device.*

2. Loosen the two (2) Phillips-head 1/4-turn screws on the rear access panel. Lift the panel and remove it.
3. Turn the Warming Unit power ON, and allow it to operate at HIGH for about three (3) to five (5) minutes before adjusting the potentiometer.
4. Insert a slotted screwdriver in the slot on top of the potentiometer.
   - If the tested operating temperature was **below** specified limits, turn the screwdriver CLOCKWISE to increase the operating temperature.
   - If the tested operating temperature was **above** specified limits, turn the screwdriver COUNTERCLOCKWISE to lower the operating temperature.
5. Adjust the potentiometer until the temperature read-out meets the limits specified in Table 2 for the HIGH temperature setting (correlated to ambient temperature as in Figure 8).
6. Verify that the MED, and then LOW temperature settings are also within specified limits. If the HIGH range is properly set, and MED and/or LOW do not meet specs, call AMI Technical Service.
7. Turn the Warming Unit power OFF, and remove the hose from the port on the temperature test device.
8. Replace the rear access panel and resecure the two (2) Phillips head 1/4-turn screws.
9. Record the maintenance action taken and hours of operation (read from the hour meter) in the *Maintenance Log* (Appendix).